JHR 90: 59–73 (2022)
doi: 10.3897/jhr.90.81886
https://jhr.pensoft.net

RESEARCH ARTICLE

JOURNAL OF Hymenoptera RESEARCH
A peer-reviewed open-access journal
The International Society of Hymenopterists

Two new species of Braconidae (Hymenoptera) from the foothills of western Himalayas, India, with a key to Oriental species of *Pambolus* Haliday and an update to the key to world species of *Paroplitis* Mason

Ankita Gupta[1], Cornelis Van Achterberg[2,3], José L. Fernández-Triana[4]

1 *ICAR-National Bureau of Agricultural Insect Resources, Post Bag No. 2491, H. A. Farm Post, Bellary Road, Hebbal, Bangalore 560 024, Karnataka, India* **2** *Naturalis Biodiversity Center, Darwinweg 2, 2333 CR Leiden, Netherlands* **3** *Zhejiang University, Hangzhou, China* **4** *Canadian National Collection of Insects, 960 Carling Ave, Ottawa, ON K1A 0C6, Canada*

Corresponding author: Ankita Gupta (drankitagupta7@gmail.com)

Academic editor: Gavin Broad | Received 9 February 2022 | Accepted 16 March 2022 | Published 29 April 2022

http://zoobank.org/C0EB0CC6-0F34-42C2-AC6D-AD63988E1B24

Citation: Gupta A, Van Achterberg C, Fernández-Triana JL (2022) Two new species of Braconidae (Hymenoptera) from the foothills of western Himalayas, India, with a key to Oriental species of *Pambolus* Haliday and an update to the key to world species of *Paroplitis* Mason. Journal of Hymenoptera Research 90: 59–73. https://doi.org/10.3897/jhr.90.81886

Abstract

Two new species of Braconidae parasitoid wasps, *Pambolus* (*Phaenodus*) *infuscatus* Gupta & van Achterberg **sp. nov.** (Pambolinae) and *Paroplitis khajjiarensis* Gupta & Fernández-Triana **sp. nov.** (Microgastrinae) are described and illustrated from Himachal Pradesh, India. A key to the Oriental species of *Pambolus* and an update to the key to world species of *Paroplitis* are provided. Additionally, *Centistes* (*Centistes*) *cuspidatus* (Haliday) (Euphorinae) is reported for the first time from the Indian geographical boundaries.

Keywords

India, new species, *Pambolus*, *Paroplitis*

Copyright *Ankita Gupta et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

The Western Himalayas encompasses one-tenth of the world's known higher-altitude species which includes the biodiversity rich Indian states of Himachal Pradesh, Jammu and Kashmir, Uttarakhand and Sikkim, where elevations vary from 300 m to more than 6000 m (Padma, 2014). The districts Kinnaur, Kullu and Chamba of Himachal Pradesh, serve as important observational sites in the high altitude transition zones or ecotones, which are rich in flora and fauna and include rare and endangered species, to show responses to climatic variations owing to their fragile landscapes (Tewari et al. 2017). The changes in altitude in the Indian Western Himalayas are dramatic, producing a range of vegetation types like alluvial grasslands, subtropical forests, conifer mountain forests and alpine meadows (Tewari et al. 2017). Despite being rich in faunal and floral diversity, the knowledge of its parasitoid wasp fauna is extremely poorly known, especially for the family Braconidae. This paper is part of a series to document the wasp diversity in the region, based on surveys undertaken in Khajjiar of the Chamba district, located at an altitude of 1920 meters.

The genus *Pambolus* Haliday, 1836 (Braconidae: Pambolinae) was earlier included in the subfamily Hormiinae Foerster, 1863 (Whitfield and Wharton 1997) but later it was transferred to a separate subfamily, Pambolinae Marshall, 1885 (van Achterberg 1995; Braet and van Achterberg 2003; van Achterberg and Braet 2004). It is subdivided into two subgenera, *Pambolus*, where females are always brachypterous or micropterous and males always macropterous, and *Phaenodus*, where females are macropterous and males are brachypterous or micropterous (Belokobylskij and Kula 2012). *Pambolus* is cosmopolitan, represented by 44 species worldwide, with seven species reported from the Oriental region, four of them found in India: *P.* (*Phaenodus*) *ignarus* Papp, *P.* (*Ph.*) *topali* Papp, *P.* (*Ph.*) *ruficeps* Belokobylskij and *P.* (*Ph.*) *shujai* Ahmad (Ahmad et al. 2019). In this paper a key to the Oriental species of the genus *Pambolus* is provided along with description of one new species from Khajjiar, Himachal Pradesh, India.

The genus *Paroplitis* Mason, 1981 (Braconidae, Microgastrinae) is distributed in the Nearctic, Palaearctic and Oriental Regions (Fernandez-Triana et al. 2013, 2020; Fujie et al. 2021) and it is rather a rarely collected taxon. The genus can be identified with key characters such as flattened mesosoma, short antenna and propodeum generally with a transverse carina. Fujie et al. (2021) reviewed the genus and referred to one undescribed species from India based on images in a PhD thesis (Ahmed, 2017). In this paper, that species is described and illustrated based on freshly collected specimens.

The genus *Centistes* (*Centistes*) Haliday, 1835 (Braconidae, Euphorinae) is distributed in the Palaearctic and Oriental Regions (Yunnan and Guizhou provinces of China) (Chen & van Achterberg 1997). The subgenus *Centistes* is represented by two species in India: *C.* (*Centistes*) *indicus* Ahmad, Haider & Shujauddin and *C.* (*Centistes*) *splendidus* Papp. In this paper, *Centistes* (*Centistes*) *cuspidatus* (Haliday) is reported for the first time from India.

Materials and methods

The specimens of the new species were collected while sweeping the forests with vegetation consisting of *Cedrus deodara* (Roxb.) and *Pinus* sp. situated in Khajjiar, Himachal Pradesh (Fig. 5A, B) which is located in the foothills of the Dhauladhar ranges of the Western Himalayas, India. The following abbreviations are used in the descriptions: F1, F3 and F4 for antennal funicular segments first, third and fourth; T1 and T2 for first and second metasomal tergites; POL- Posterior Ocellar Line; OOL- Ocular Ocellar Line; OD- Ocellar Diameter. Morphological terminology in general follows van Achterberg (1993). Photos were taken with a Leica M 205 A stereozoom microscope with Leica DC 420 inbuilt camera using automontage software (version 3.8). The types of new species are deposited in the National Insect Museum (NIM) of ICAR-National Bureau of Agricultural Insect Resources (ICAR-NBAIR), Bengaluru, India.

Species description

***Pambolus* (*Phaenodus*) *infuscatus* Gupta & van Achterberg, sp. nov.**
http://zoobank.org/7A4057C8-6D0F-42DD-81CA-ED932CE46FF7
Figs 1, 2

Type material. ***Holotype.*** India. ♀; Himachal Pradesh, Chamba District, Khajjiar, 32.555795°N, 76.0655834°E, 24 Sept. 2014; Ankita Gupta leg; (NIM). code–NBAIR/Brac/Pamb/Pamb/24914A (NIM).

Etymology. The species epithet "*infuscatus*" is derived from the character of the wing which is largely infuscated.

Diagnosis. Antenna of ♀ 1.3× longer than body, without ivory or white apical segments and in total with about 24 segments; eye about 1.6 times longer than temple in dorsal view and temple gradually narrowed behind eyes (Fig. 1C); propodeal spine distinctly protruding, longer than wide basally (Fig. 1A, G); vein 1-SR+M of fore wing distinctly bent; vein SR1 of fore wing 2.2× longer than vein 3-SR; pterostigma 4.1× longer than wide (Fig. 2A); hind femur about 3.8× longer than wide; length of first tergite about equal to its apical width (Fig. 2B); second tergite smooth; setose part of ovipositor sheath 0.3× as long as hind tibia (Fig. 2C); pterostigma largely dark brown; fore wing membrane (except apex of wing) largely dark brown (Fig. 2A); hind femur and tibia largely dark brown, hind tarsus ivory.

Description. Female. Body length 3.0 mm; fore wing length 2.5 mm.

Head. Antenna 24 segmented, 1.3× as long as body; scape 1.5× as long as wide, F1 3.2× as long as wide and as long as F2; head transverse, ca. 1.1× as wide as long in dorsal view, temple smooth, distinctly widening ventrally, widest distance from eyes 2.0× as long as eye dorsally; eye length 1.6× temple in dorsal view (Fig. 1C); POL: OOL: OD = 7: 13: 5; malar space 3.8× basal width of mandible; face transversely rugulose and setose, clypeus smooth, distinctly separated from face, vertex finely granulate around ocelli with shallow rugae, vertex and occiput rather transversely rugulo-rugose.

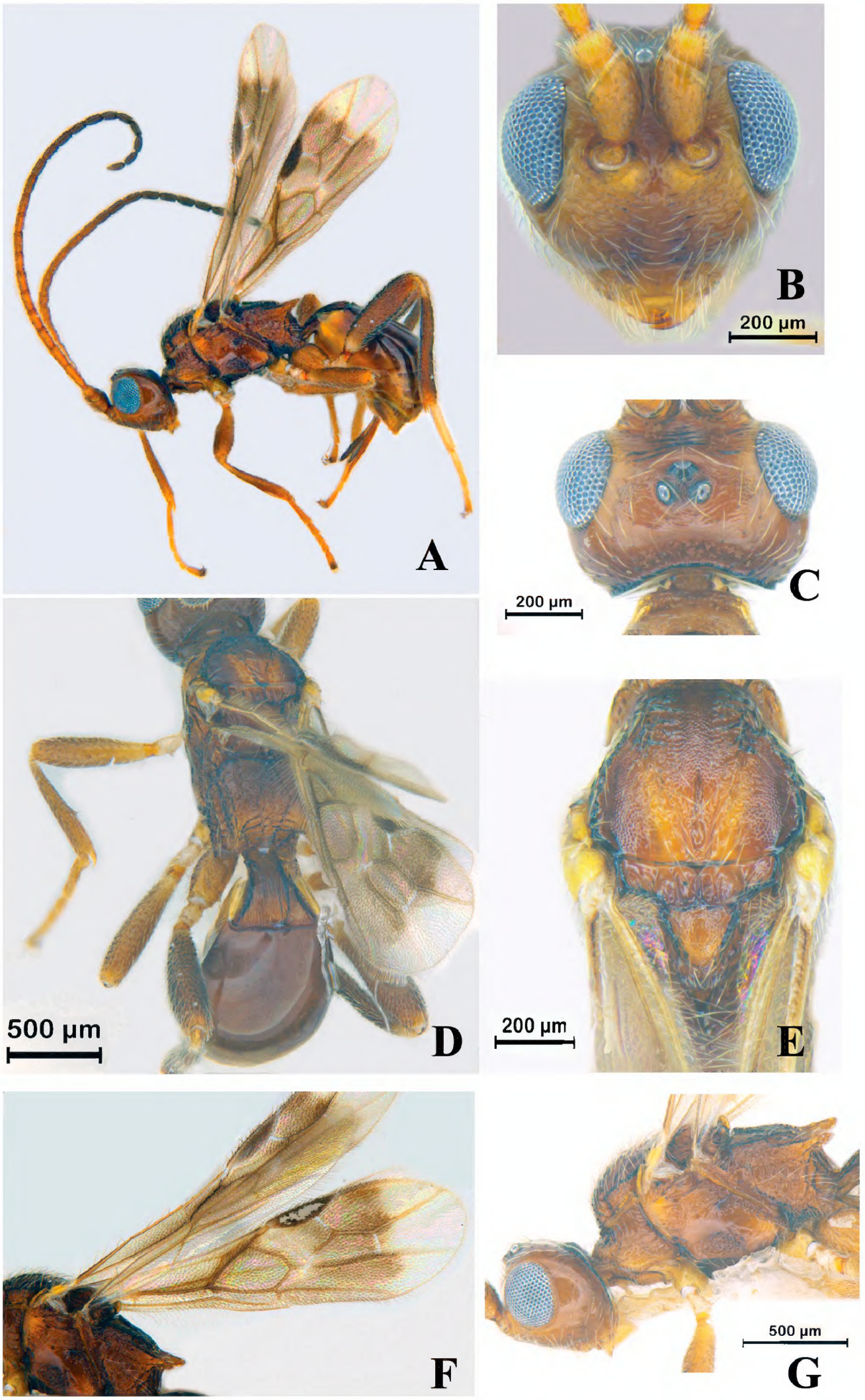

Figure 1. Female holotype of *Pambolus* (*Phaenodus*) *infuscatus* Gupta & van Achterberg sp. nov. **A** habitus **B** head (in frontal aspect) **C** vertex **D** mesosoma and metasoma (in dorsal aspect) **E** mesoscutum and scutellum (in dorsal aspect) **F** fore wing and hind wing **G** mesopleuron and propodeum (in lateral aspect).

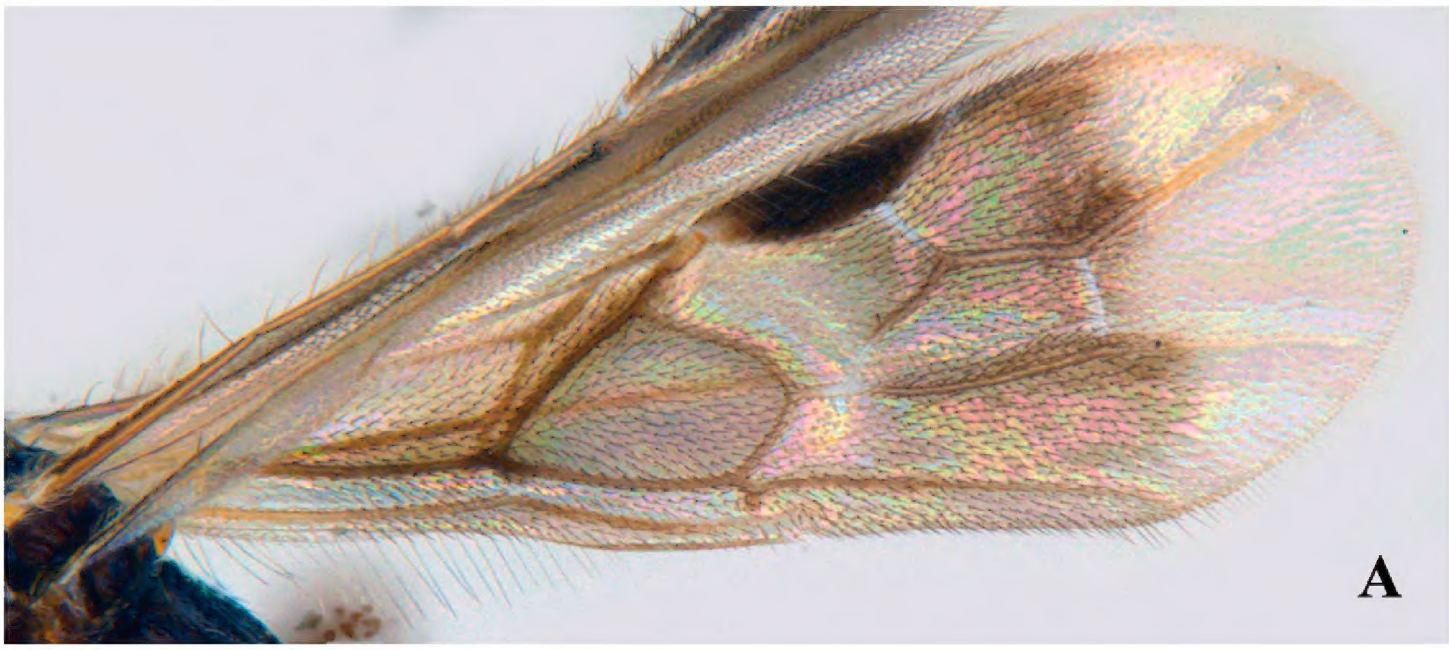

Figure 2. Female holotype of *Pambolus* (*Phaenodus*) *infuscatus* Gupta & van Achterberg sp. nov. **A** fore wing **B** propodeum and T1 **C** metasoma with hind femur and tibia.

Mesosoma. Mesosoma 1.7× as long as wide in dorsal view, median and lateral lobes of mesoscutum granulate-reticulate, sparsely setose; notauli indistinct anteriorly surrounded by strong crenulae, rather prominent posteriorly; scutellar sulcus deep and broad with six crenulae, mesoscutum median length 2× as long as scutellum, propodeal spine triangular-shaped (Fig. 1A), shorter than second and third tarsomeres of hind tarsus.

Wings. Fore wing 3.1× as long as wide, 2.4× as long as hind tibia; pterostigma 4.1× as long as wide, 0.7× length of R1, r arising slightly behind middle of pterostigma;

r almost subequal width of pterostigma; 3-SR 1.6× as long as r, 1.2× 2-SR, 0.5× SR1; r-m 0.6× 3-SR; marginal cell 2.5× as wide as high, SR1 bent at an angle; 1-SR+M bent (Fig. 2A); hind wing 5.5× as long as wide.

Legs. Hind leg setose, hind femur 3.8× as long as wide, hind tarsus almost as long as hind tibia, hind basitarsus 0.7× as long as tarsal segment 2–4 combined.

Metasoma. Metasoma 0.7× as long as head and mesosoma combined in lateral view; T1 longitudinally striated, strongly broadening posteriorly; T1 0.9× as long as broad apically, spiracles almost near middle; remaining tergites smooth; ovipositor sheath 0.8× as long as tarsomere 2–4 combined; setose part of ovipositor sheath 0.3× as long as hind tibia; ovipositor short, straight and pointed.

Colour. Head yellowish brown with dark brown patches; eyes grey, stemmaticum, propleuron, mesopleuron, propodeum black on edges; mesonotum dark brown except yellowish notaulic region (middle and posterior), legs in general brownish except pale trochantellus, yellowish tarsi and dark brown hind femur and tibia (but bases of femur and tibia pale); metasoma reddish brown; T1 yellowish brown with darker edges, ovipositor sheath dark brown; mandibles yellowish brown; tip of mandibles and tarsal claws dark brown, antennal segment F1–F10 yellowish brown; F11–F22 dark brown; ocelli transparent; wings infuscate except apical one fourth, pterostigma dark brown, veins brown, but veins SR1 (except base) and apical half of vein 1-R1 yellow and veins r and r-m subhyaline (Fig. 2A).

Male. Unknown.

Host. Unknown.

Distribution. India (Himachal Pradesh).

Remarks. This new species comes near to *Pambolus* (*Ph.*) *topali* Papp, 1996, however differs in the following characters: Eyes about 1.6× as long as temple in dorsal view; hind femur 3.8 times longer than broad medially and antenna with 24 segments (*vs* eyes about 2.0× as long as temple in dorsal view; hind femur 4.6–5.0× as long as broad medially; antenna with 27–30 segments).

Key to the Oriental species of *Pambolus* Haliday

1 Males macropterous and vein r-m of fore wing absent; females more or less brachypterous or nearly wingless and dorsal half of temple sculptured and rather matt; mesopleuron usually sculptured; [unknown from Oriental region] ..... **subgenus *Pambolus* Haliday, 1836**

– Males macropterous and vein r-m of fore wing present, if brachypterous then dorsal half of temple smooth and shiny; females macropterous and vein r-m of fore wing present (Figs 1F, 2A); mesopleuron smooth (at least medially) (Fig. 1G); subgenus *Phaenodus* Foerster, 1863 ..... **2**

2 Ovipositor sheath 1.0–1.3× as long as hind tibia; antenna of ♀ about twice as long as body (and at least as long as fore wing) and with 37–51 segments; [vein r of fore wing as wide as vein 3-SR or narrower; pterostigma about 4× as long as wide] **3**

– Ovipositor sheath 0.3–0.7× as long as hind tibia (Fig. 2C); antenna of ♀ 0.9–1.7× as long as body (or fore wing) and with 24–41 segments **4**

3 Ovipositor sheath about as long as hind tibia; antenna of ♀ with about 37 segments; propodeal spine parallel-sided; vein 3-SR of fore wing as wide as vein r or nearly so; eye about 3× as long as temple in dorsal view .... ***P. (Phaenodus) nepalensis*** **Papp, 1996**

– Ovipositor sheath about 1.3× as long as hind tibia; antenna of ♀ with about 51 segments; propodeal spine widened basally; vein 3-SR of fore wing distinctly wider than vein r; eye about twice as long as temple in dorsal view .... ***P. (Phaenodus) mostovskii*** **(Belokobylskij, 1999)**

4 Length of first metasomal tergite 0.7× its apical width; eye about 4.0× as long as temple in dorsal view and temple directly narrowed behind eyes; apical antennal segments of ♀ yellowish brown; face smooth; [malar space 2.0–2.5× basal width of mandible; pterostigma 4–5× longer than wide; antenna of ♀ with about 26 segments] ..... ***P.*** (***Phaenodus***) ***ignarus*** **Papp, 1996**

– Length of first tergite 0.9–1.3× its apical width (Fig. 2B); eye 1.3–3.3× as long as temple in dorsal view and temple roundly narrowed behind eyes (Fig. 1C, but more directly so in *P. ruficeps*); apical antennal segments of ♀ often ivory or white **5**

5 Second metasomal tergite largely striate; propodeal spine slightly protruding, about as long as wide basally; temple directly narrowed behind eye and head distinctly transverse in dorsal view; [hind femur about 3.4× longer than wide; antenna of ♀ with about 24 segments and 1.3× longer than body; pterostigma pale brownish] .... ***P. (Phaenodus) unicolor*** **Belokobylskij, 1994**

– Second tergite smooth or largely so; propodeal spine distinctly protruding, longer than wide basally (Fig. 1A); temple usually less narrowed behind eye and head less transverse in dorsal view (Fig. 1C, except in *P. ruficeps* but has 33–40 antennal segments) **6**

6 Antenna of ♀ 1.5–1.7× as long as body; eye 2.7–3.3× as long as temple in dorsal view and temple more directly narrowed behind eyes; hind femur 3.5–3.8× longer than wide; first metasomal tergite 1.1–1.3× longer than its apical width; [antenna with 33–40 segments and 5–11 ivory or whitish apical segments; face smooth (according to original description variable, sometimes sculptured), vertex and occiput coriaceous to rugulose] .... ***P.*** (***Phaenodus***) ***ruficeps*** **Belokobylskij, 1988**

– Antenna of ♀ 0.9–1.3× as long as body (Fig. 1A); eye usually 1.3–2.3× as long as temple in dorsal view and temple less directly narrowed behind eyes, but eyes larger and temples more retracted in *P. caudalis*; hind femur 3.8–5.0× longer than wide **7**

7 Vein r of fore wing about twice as wide as vein 3-SR; pterostigma about 3× longer than wide; antenna of ♀ about as long as body; [antenna of ♀ apically with about 13 ivory or white segments and in total with about 29 segments; wing membrane subhyaline] ..... ***P.*** (***Phaenodus***) ***shujai*** **Ahmad, 2019**

– Vein r of fore wing as wide as vein 3-SR; pterostigma 4–6× longer than wide (Fig. 2A); antenna of ♀ 1.2–1.3× longer than body **8**

8 Eye about 3× longer than temple in dorsal view and temple more narrowed behind eyes; pterostigma light brown; antenna of ♀ with 5–15 ivory or white apical segments and antenna with 31–41 segments .... ***P. (Phaenodus) caudalis*** **Belokobylskij, 1988**

– Eye about twice longer than temple in dorsal view or less and temple less narrowed behind eyes (Fig. 1C); pterostigma yellow or dark brown; antenna of ♀ without ivory or white apical segments and in total with 24–30 segments....**9**

9 Pterostigma yellow; wing membrane subhyaline; vein 1-SR+M of fore wing straight or nearly so; hind femur, tibia and tarsus yellow; vein SR1 of fore wing 3.2× longer than vein 3-SR .....***P.*** (***Phaenodus***) ***topali*** **Papp, 1996**

– Pterostigma largely dark brown; fore wing membrane (except apex of wing) largely dark brown (Fig. 2A); vein 1-SR+M of fore wing distinctly bent (Figs 1F, 2A); hind femur and tibia largely dark brown, hind tarsus ivory (Fig. 1A); vein SR1 of fore wing 2.2× longer than vein 3-SR (Figs 1F, 2A)..... ..... ***P.*** (***Phaenodus***) ***infuscatus*** **sp. nov.**

Paroplitis khajjiarensis **Gupta & Fernández-Triana, sp. nov.**
http://zoobank.org/1FB9B1E9-5CF1-47C6-AEC0-C04D5AF96C5D
Figs 3, 4

Type material. ***Holotype.*** India. ♀; Himachal Pradesh, Chamba District, Khajjiar, 32.555795°N, 76.0655834°E, 24 Sept. 2014; Ankita Gupta leg; (NIM), code–NBAIR/Brac/Micg/Paro/24914A (NIM).

Paratype. India. one ♂, same data as holotype, code–NBAIR/Brac/Micg/Paro/24914B (NIM).

Etymology. The species epithet is derived from the collection locality.

Description. Female. Body length 3.16 mm; fore wing length 3.30 mm.

Head 1.57× as wide as long; face sparsely setose, frons bare and eyes densely setose; clypeus 2.46× as wide as long. OOL/OD: 2.7×; POL/OD: 2.2×. Scape 1.82× as wide as long; pedicel 1.27× as wide as long; F2 2.6× as long as wide; F14 1.7× as long as wide; F15 1.8× as long as wide; F2 L/F14 L: 1.6×.

Mesosoma 1.33× longer than wide; mesoscutum sparsely setose and shallowly punctate. Fore wing length: 3.30 mm. Fore wing with vein 3-Cu1 entirely nebulous; vein 1-R1 (0.58) shorter than pterostigma length (0.74) and a little longer than distance delimited between end of vein 1-R1 and end of vein SR1 (0.47). Fore wing with areolet triangular and relatively small, its maximum height 0.33× vein r length, its maximum width 0.72× vein r length. Length of veins M+Cu1: 1-M: 1.03: 0.33; 1Cu1: 2Cu1:m-cu: 0.19: 0.21:0.18. Propodeum rugose, with rugosity along median transverse area, with trace of some transverse carina; median longitudinal carina complete; propodeal areola absent. Metafemur L/W: 3.6×.

Metasoma. T1 parallel sided and strongly longitudinally striate, T2 longitudinally striate on lateral sides and basal half, remaining tergites smooth and shiny. T1 median

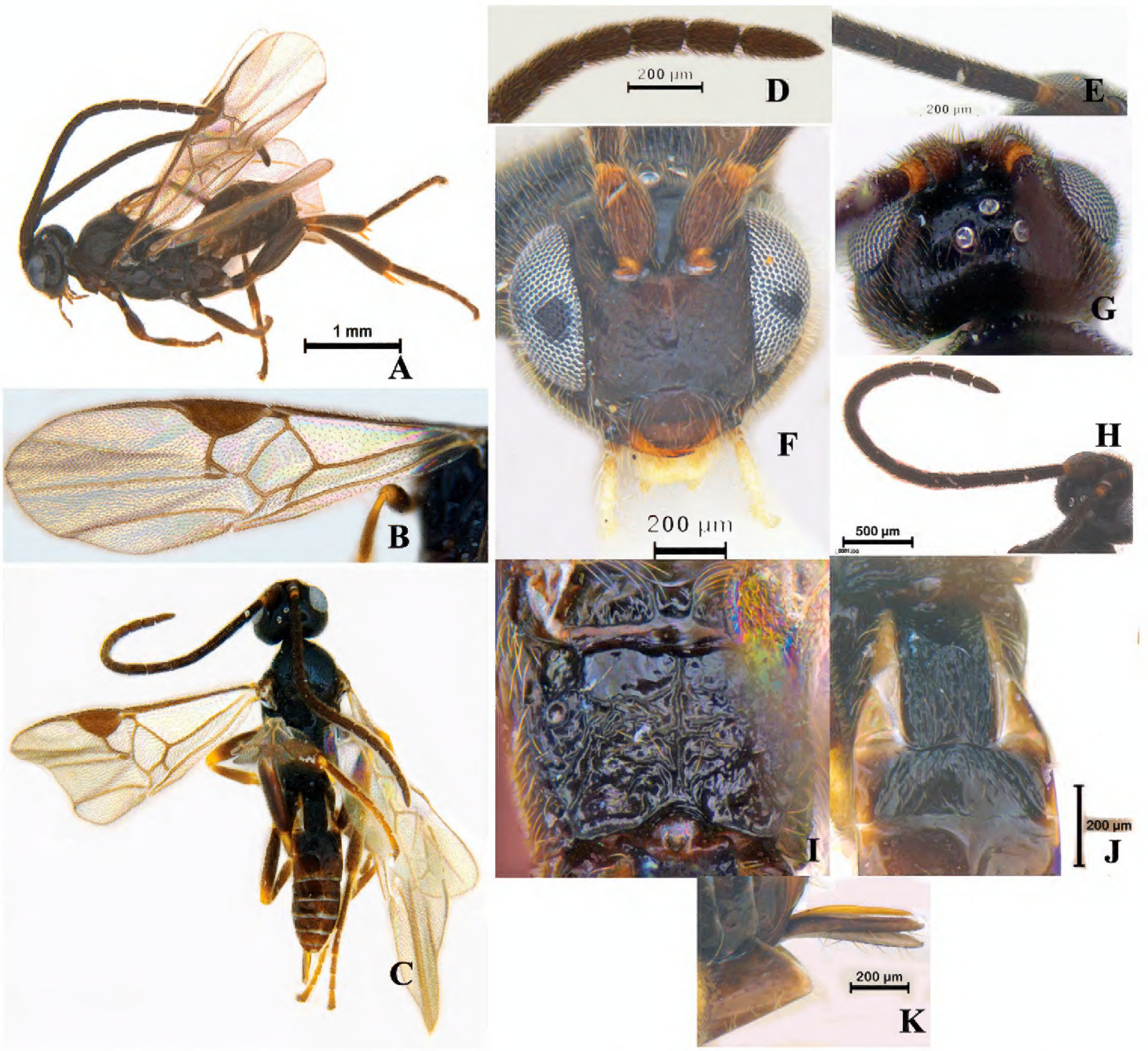

Figure 3. *Paroplitis khajjiarensis* Gupta & Fernández-Triana sp. nov. **A** male in habitus (lateral view) **B** female fore wing **C** female (in dorsal aspect) **D** female F10–F15 **E** female F1–F3 **F** female head in frontal view **G** female vertex **H** female antenna **I** female propodeum **J** female T1 and T2 **K** ovipositor sheaths.

length 2× its width at posterior margin; T2 width at posterior margin 2.29× its median length. Hind tibia L: 1.14 mm. Ovipositor sheath L: 0.44 mm. Hind tibia length 2.59× length of ovipositor sheath. Maximum length of setae on ovipositor sheath (0.09) at most slightly longer than maximum width of ovipositor sheath (0.06). Hypopygium sclerotized.

Colour. Female (Fig. 3) Body dark brown to black and eyes grey in colour. Palpi yellow brown to pale yellow. Antenna dark brown except basal tip of scape and apical portion of pedicel yellowish brown. Ocelli off white. Clypeus dark brown. Mandibles yellowish brown, darker at apical tips. Legs in general dark brown except basal and apical tip of femora, tibiae and basitarsi.

Male. Paratype (Fig. 4). Body length 2.74 mm. Darker than female. T1 relatively less striated and T2 nearly smooth.

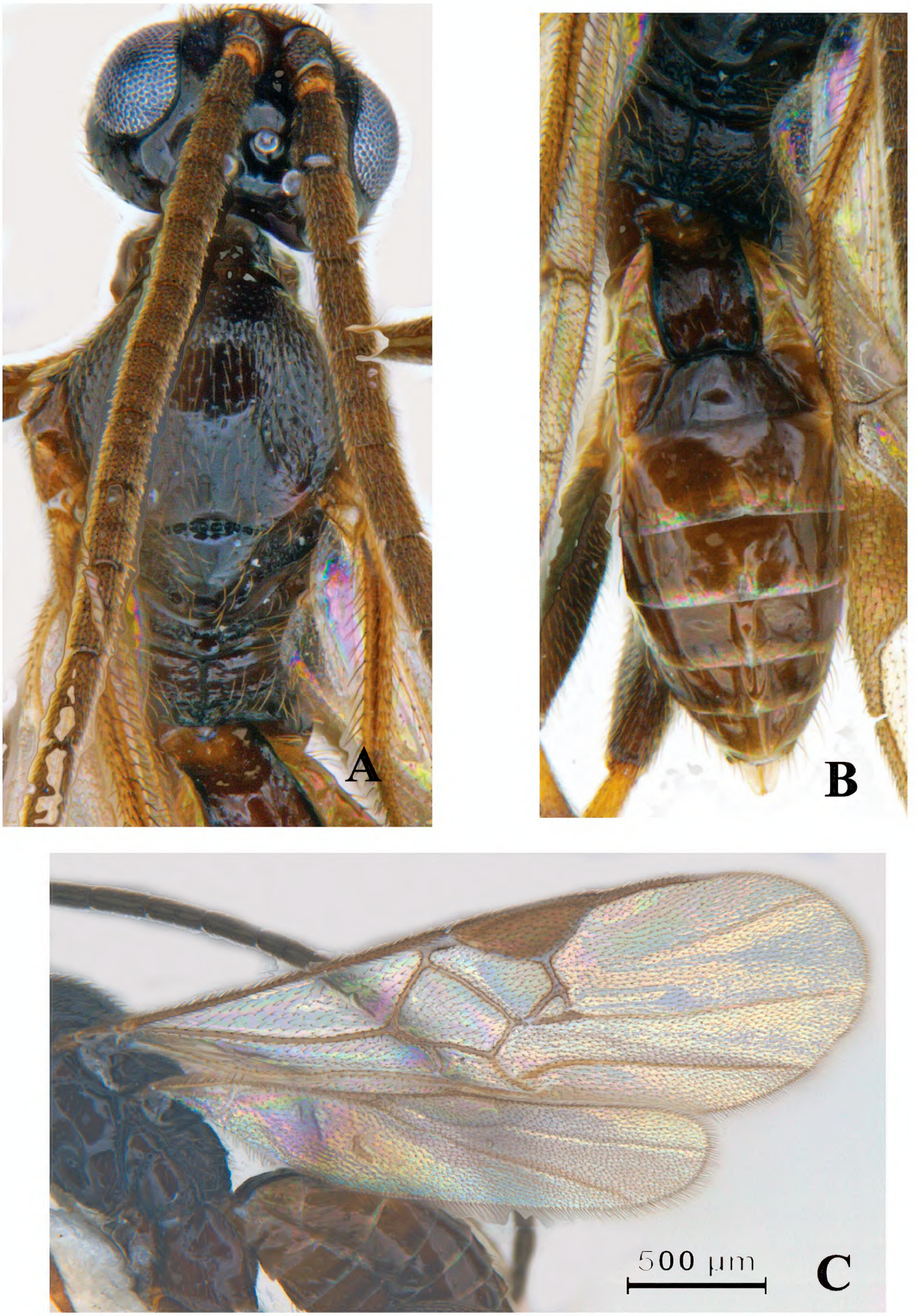

Figure 4. Male Paratype of *Paroplitis khajjiarensis* Gupta & Fernández-Triana sp. nov. **A** head and mesosoma (in dorsal aspect) **B** propodeum and metasoma **C** wings.

Figure 5. Collection localities of *Pambolus* (*Phaenodus*) *infuscatus* Gupta & van Achterberg sp. nov. (in red colour) and *Paroplitis khajjiarensis* Gupta & Fernández-Triana sp. nov. (in blue colour).

Distribution. India (Himachal Pradesh). Besides the type locality (Khajjiar), Ahmed (2017) also reported the species from the localities of Samba and Poonch (Fig. 5A, B), in the Jammu and Kashmir state. The type locality (Khajjiar) is approximately 160 kms away from Samba (J&K). Both these states share borders and have a lot of similarity in climate and vegetation.

Remarks. *Paroplitis khajjiarensis* was keyed out (as an undescribed species) in Fujie et al. (2021). Those authors were only able to see some images of that species in Ahmed (2017, Plate 32). Our specimens and the one illustrated in Ahmed (2017) are very similar and we consider them to represent the same species.

Here we propose a correction to the first couplet of the key by Fujie et al. (2021) based on the specimens we have examined, as we found that T2 is not entirely sculptured (as considered by those authors) but there is a smooth area on most of the apical half of the tergite. Thus, the first half of that couplet should be amended to "T1 entirely sculptured and T2 mostly sculptured (with longitudinal striae on lateral sides and basal half of tergite)". The rest of the key remains the same as in Fujie et al. (2021).

Centistes (*Centistes*) *cuspidatus* (Haliday)

Figs 6, 7

Material examined. India. 4♀; Himachal Pradesh, Chamba District, Khajjiar, 32.555795°N, 76.0655834°E, 24 Sept. 2014; Ankita Gupta leg; (NIM), code–NBAIR/Brac/Micg/Cent/24914 (NIM).

Brief diagnosis. Length of body 3.03 mm. Antennae 25 segmented. Eye length subequal to temple in dorsal view. Temple almost linearly narrowed behind eye. Precoxal sulcus completely absent. Fore wing: 1-SR+M of fore wing distinct, m-cu not interstitial. Fifth tarsal segment of hind legs distinctly thickened. Propodeum rugose

Figure 6. *Centistes* (*Centistes*) *cuspidatus* (Haliday) Female in habitus (lateral view).

anteriorly. First metasomal tergite distinctly longitudinally striate, without dorsal and medio-longitudinal carinae; 1.1–1.3 times longer than its apical width. Second metasomal tergite length subequal to its apical width. Length of ovipositor sheath almost subequal to first metasomal tergite length.

Remarks. The genus *Centistes* (*Centistes*) Haliday, is mainly distributed in the Palaearctic and Oriental Regions (Yunnan and Guizhou provinces of China). Based on the surveys, the distribution range of this species is expanded to India.

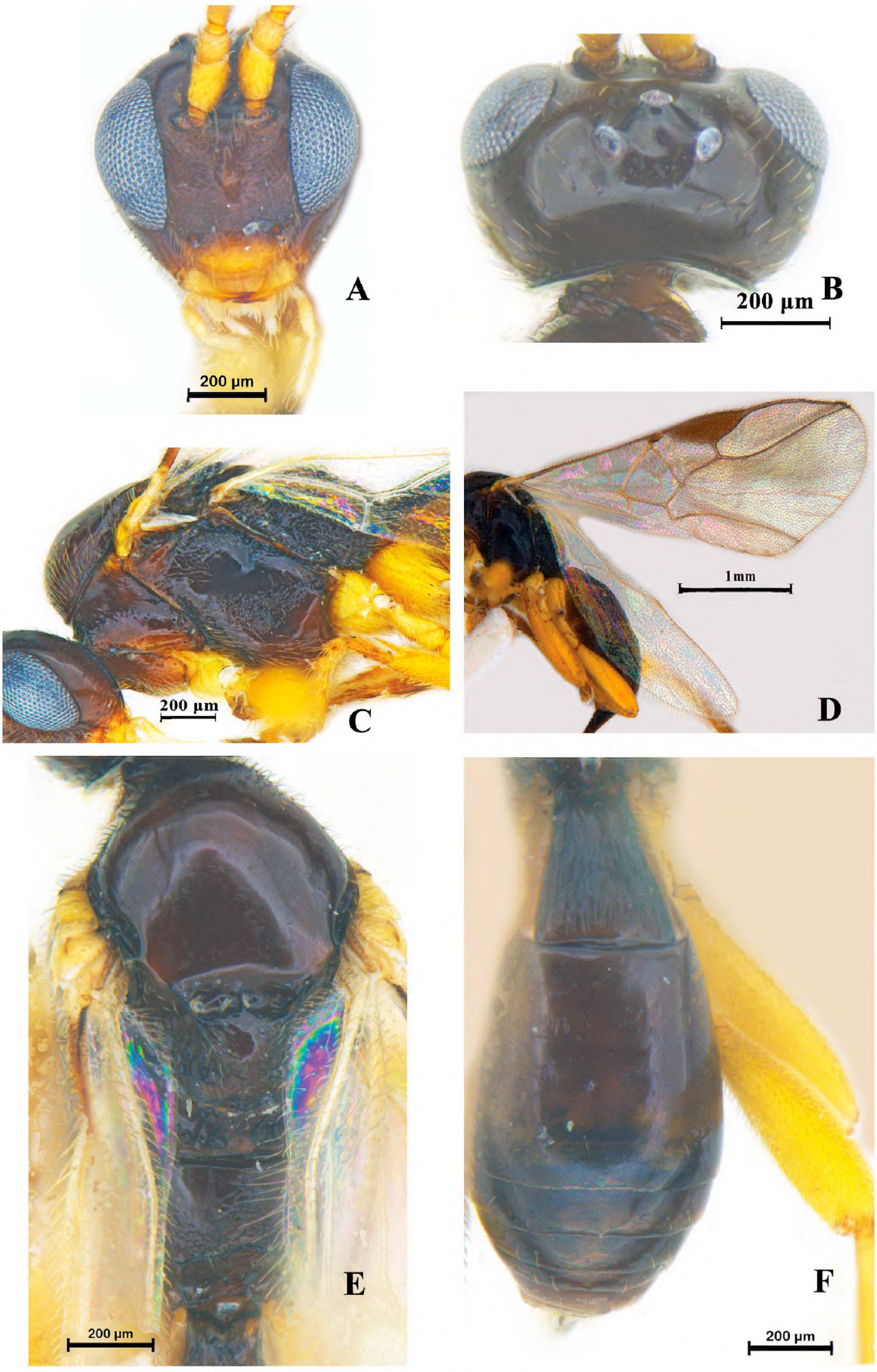

Figure 7. *Centistes* (*Centistes*) *cuspidatus* (Haliday) (Female) **A** head in frontal view **B** vertex **C** mesopleuron **D** wings **E** mesosoma **F** metasoma.

Acknowledgements

AG is thankful to the Indian Council of Agricultural Research, New Delhi and to the director of ICAR–NBAIR for research facilities. She acknowledges financial support of SERB scheme: CRG/2021/001523 for Braconidae taxonomic studies.

References

Ahmed I (2017) Taxonomic Studies on Braconidae (Hymenoptera: Insecta) from Jammu Division of the State Jammu and Kashmir, India. Doctoral dissertation, Aligarh Muslim University.

Ahmad Z, Ghramh HA, Ansari A (2019) Two new species of braconid wasps (Hymenoptera, Braconidae) from India. ZooKeys 889: 23–35. https://doi.org/10.3897/zookeys.889.36436

Braet Y, van Achterberg C (2003) New species of *Pambolus* Haliday and *Phaenocarpa* Foerster (Hymenoptera: Braconidae: Pambolinae, Alysiinae) from French Guyana, Suriname and Panama. Zoologische Mededelingen Leiden 77(7): 153–17.

Belokobylskij SA, Kula RR (2012) Review of the brachypterous, micropterous, and apterous Braconidae of the cyclostome lineage (Hymenoptera: Ichneumonoidea) from the Palearctic Region. Zootaxa 3240: 1–62. https://doi.org/10.11646/zootaxa.3240.1.1

Chen X, van Achterberg C (1997) Revision of the subfamily Euphorinae (excluding the tribe Meteorini Cresson) (Hymenoptera: Braconidae) from China. Zoologische verhandelingen Leiden 313: 1–217.

Fernandez-Triana J, Ward DF, Cardinal S, van Achterberg C (2013) A review of *Paroplitis* (Braconidae, Microgastrinae) and description of a new genus from New Zealand, *Shireplitis*, with convergent morphological traits. Zootaxa 3722(4): 549–568. https://doi.org/10.11646/zootaxa.3722.4.6

Fernandez-Triana J, Shaw MR, Boudreault C, Beaudin M, Broad GR (2020) Annotated and illustrated world checklist of Microgastrinae parasitoid wasps (Hymenoptera, Braconidae). ZooKeys 920: 1–1089. https://doi.org/10.3897/zookeys.920.39128

Foerster A (1863) Synopsis der Familien und Gattungen der Braconiden. Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande und Westfalens 19: 225–288.

Fujie S, Japoshvili G, Fernandez-Triana J (2021) Review of the world species of *Paroplitis* Mason, 1981 (Hymenoptera, Braconidae, Microgastrinae), with description of three new species. Deutsche Entomologische Zeitschrift 68(1): 33–43. https://doi.org/10.3897/dez.68.59641

Haliday AH (1835) Essay on parasitic Hymenoptera of the Ichneumones Adsciti. Entomological Magazine 2: 20–45, 458–468.

Haliday AH (1836) Essay on parasitic Hymenoptera. Entomological Magazine 4: 38–59.

Marshall TA (1885) Monograph of British Braconidae. Part I. Transactions of the Entomological Society of London 1885: 1–280.

Mason WRM (1981) The polyphyletic nature of *Apanteles* Foerster (Hymenoptera: Braconidae): A phylogeny and reclassification of Microgastrinae. Memoirs of the Entomological Society of Canada, Ottawa, 147 pp. https://doi.org/10.4039/entm113115fv

Padma TV (2014) Himalayan plants seek cooler climes. Nature 512: e359. https://doi.org/10.1038/512359a

Papp J (1996) On the genus *Pambolus* (Hymenoptera: Braconidae: Pambolinae), with description of four new tropical species. Acta Zoologica Academiae Scientiarum Hungaricae 42: 41–57.

Tewari VP, Verma RK, von Gadow K (2017) Climate change effects in the Western Himalayan ecosystems of India: evidence and strategies. Forest Ecosystems 4 (13): 1–9. https://doi.org/10.1186/s40663-017-0100-4

van Achterberg C (1993) Illustrated key to the subfamilies of the Braconidae (Hymenoptera: Ichneumonoidea). Zoologische Verhandelingen Leiden 283: 1–189.

van Achterberg C (1995) Generic revision of the subfamily Betylobraconinae (Hymenoptera: Braconidae) and other groups with modified fore tarsus. Zoologische Verhandelingen Leiden 298: 1–242.

van Achterberg C, Braet Y (2004) Two new species of *Pambolus* Haliday (Hymenoptera: Braconidae: Pambolinae) from Argentina. Zoologische Mededelingen Leiden 78(22): 337–344

Whitfield JB, Wharton RA (1997) Subfamily Hormiinae, In: Wharton RA, Marsh PM, Sharkey MJ (Eds) Manual of the New World genera of the family Braconidae (Hymenoptera). The International Society of Hymnenopterists, Washington D.C., 284–301.